



Toxicology and Risk Assessment
Conference
2018

Cincinnati, Ohio

Methods, Models, and Emerging Concerns

Preliminary Conference Program

West Chester, Ohio
April 23 ~ 26, 2018

The 2018 Toxicology and Risk Assessment Conference

Models, Methods, and Emerging Concerns

Conference Program

April 23 - 26, 2018

**Centre Park of West Chester
West Chester, Cincinnati, Ohio**

Conference Co-Chairs:

David R. Mattie, PhD, DABT
711 HPW/RHDJ, Wright Patterson Air Force Base

Elizabeth Irvin-Barnwell, PhD
The Centers for Disease Control and Prevention, the Agency for Toxic Substances and Disease
Registry

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General Information

Conference Title	2018 Toxicology and Risk Assessment Conference Models, Methods, and Emerging Concerns
Sponsors	Centers for Disease Control and Prevention, Agency for Toxic Substances and Disease Registry; Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health; Department of Defense, US Air Force, 711th Human Performance Wing, Air Force Research Laboratory; Department of Defense, US Army Public Health Center; National Institutes of Health, National Institute of Environmental Health Sciences – Superfund Research Program.
Endorsed By	Tri-Service Toxicology Consortium
Continuing Education Accreditation	Centers for Disease Control and Prevention American Board of Preventive Medicine (see final program for details)
Conference Site	Centre Park of West Chester 5800 Muhlhauser Road West Chester, Cincinnati, Ohio, 45069
Conference Dates	April 23 - 26, 2018
Messages	Messages to attendees can be relayed to Conference Committee members by calling 513-874-2744.

2018 TRAC Steering Committee Members

Shannon Berg, National Institute for Occupational Safety and Health (NIOSH)
Suzanne E. Fenton, National Institutes of Health (NIH)/National Institute of Environmental Health Sciences (NIEHS)
Jeff Fisher, US Federal Drug Administration
Linda Gaines, US Environmental Protection Agency (EPA)
Heather Henry, NIH/NIEHS
William Howard, US Navy
Naomi Hudson, NIOSH
Sherri Hutchens, US Army
Terra D. Irons, US Veterans Administration
Elizabeth Irvin-Barnwell, Steering Committee Co-chair, Centers for Disease Control and Prevention (CDC)/Agency for Toxic Substances and Disease Registry (ATSDR)
Mark S. Johnson, US Army
Abdel Kadry, US EPA
J. Phillip Kaiser, US EPA
John Lipscomb, US EPA
Jed Lynn, US Navy
David R. Mattie, Steering Committee Co-chair, 711 HPW/RHDJ, Wright Patterson Air Force Base, US Air Force
Camilla A. Mauzy, US Air Force
Elaine A. Merrill, US Air Force
Anu Mudipalli, US EPA
Karen L. Mumy, US Navy
Sudha P. Pandalai, Continuing Education Course Director, NIOSH
Michael J. Quinn, US Army
Gunda Reddy, US Army
Laurie E. Roszell, US Army
John Wheeler, CDC/ATSDR
George Woodall, US EPA
Rachel Worley, ATSDR
Dan Xu, US Navy

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CDC/ATSDR: Vicki Garrett, Collette J. Johnson, Courtne Watson

CDC continuing education office: Oksana Bilukha, Sharon Hall, Laneatria Lynn Willis

CDC/NIOSH: John Gibbins, Kathleen Goedel, Stephen R. Leonard, and Brenda Proffitt

US Air Force: Winona J. Doubrava, Donna R. Young

US Navy: Christine Sintz

Henry Jackson Foundation for the Advancement of Military Medicine: Lilly Adams, Robyn Hulvey,

Rochelle Jones, and John Rosenquist

The staff at the Centre Park West, West Chester, Cincinnati, Ohio

The 2018 TRAC Poster Session Co-Chairs would like to acknowledge the following individuals for their contributions as judges for the Trainee Poster Competition:

Jeffrey Dean, PhD, US Environmental Protection Agency, Cincinnati, OH

Matthew Shipman, LCDR, US Navy, Wright Patterson Air Force Base, Dayton, OH

Randall J. Smith, MS, National Institute for Occupational Safety and Health, Cincinnati, OH

Sincerely,

J. Phillip Kaiser, PhD, DABT, US Environmental Protection Agency

Dan Xu, LT, MSC, US Navy

Poster Session Co-chairs

TRAC 2018

Conference Disclaimer

The findings and conclusions presented in the workshops, plenary, and main session platform presentations, poster session presentations, and CE activities in this conference are solely those of the planners/presenters/authors and do not represent any particular policy or agency determination of any of the home agencies or organizations of the planners/presenters/authors or any of the sponsoring agencies or organizations of the Toxicology and Risk Assessment Conference, unless expressly noted.

Conference Overview

Monday, April 23, 2018 to Thursday, April 26, 2018: Registration 8:00 am – 2:00 pm

Monday, April 23, 2018: Morning Workshops 8:30 am – 11:45 am

- A1.** Workshop: Risk Communication: Explaining Technical Health Risks to a Potentially Affected Population – A Risk Communication Challenge
- A2.** Workshop: Basic Concepts in Risk Assessment and Dose-Response Modeling

Monday, April 23, 2018: Afternoon Workshops 1:00 pm – 5:00 pm

- B1.** Workshop: Risk Communication: Explaining Technical Health Risks to a Potentially Affected Population – A Risk Communication Challenge
- B2.** Workshop: Basic Concepts in Risk Assessment and Dose Response Modeling

Tuesday, April 24, 2018: Morning Session 8:30 am – 11:45 am

Welcome and Conference Opening Remarks

- PL.** Plenary Session: Models, Methods, and Emerging Concerns in Toxicology and Risk Assessment

Tuesday, April 24, 2018: Afternoon Session 1:00 pm – 5:00 pm

- C1.** Methods for Assessing Long-term Effects after Acute Exposures: Case Studies with Respiratory Irritants
- C2.** Toxicity Testing of Energetic Materials as an Example of Pre-acquisition Screening and Risk Assessment in the DoD
- C3.** Current Practices in Federal Agencies Using Computational Tools in Safety Science

Tuesday, April 24, 2018: Evening Session 5:45 pm – 7:45 pm

Poster Session and Trainee Poster Competition

Wednesday, April 25, 2018: Morning Sessions 8:30 am – 11:45 am

- D1.** Understanding Risks from Exposures to Perfluorinated Alkyl Substances (PFAS): Current Science and Research Needs
- D2.** Chemical Exposures and Neurological Health Effects

Wednesday, April 25, 2018: Afternoon Sessions 1:00 pm – 5:00 pm

- E1.** Ongoing Risk Assessment Efforts for Per- and Polyfluoroalkyl Substances
- E2.** Microbiome Toxicology: Understanding the Role of the Microbiome in Modulating Toxin Exposure-Outcome

Thursday April 26, 2018: Morning Workshops 8:30 am – 11:45 am

- F1.** Workshop: Human Health Risk Assessment: A Case Study Application of Principles in Dose-Response Assessment
- F2.** Workshop: Chemical Mixtures Health Risk Assessment of Environmental Contaminants: Concepts, Methods, Applications

Thursday, April 26, 2018: Afternoon Workshops 1:00 pm – 5:00 pm

- G1.** Workshop: Human Health Risk Assessment: A Case Study Application of Principles in Dose-Response Assessment
- G2.** Workshop: Chemical Mixtures Health Risk Assessment of Environmental Contaminants: Concepts, Methods, and Applications

Monday, April 23, 2018

Conference Program

Monday, April 23, 2018

8:00 am – 5:00 pm

8:00 am – 2:00 pm

Registration

Workshops

***(Separate registration required)**

Workshop times include 30 min break

8:30 am – 11:45 am

- A1** Risk Communication: Explaining Technical Health Risks to a Potentially Affected Population - A Risk Communication Challenge
- A2** Basic Concepts in Risk Assessment and Dose-Response Modeling

11:45 am – 1:00 pm

Lunch

1:00 pm – 5:00 pm

- B1** Risk Communication: Explaining Technical Health Risks to a Potentially Affected Population - A Risk Communication Challenge
- B2** Basic Concepts in Risk Assessment and Dose-Response Modeling

8:30 am - 5:00 pm

A1 and B1: Risk Communication: Explaining Technical Health Risks to a Potentially Affected Population - A Risk Communication Challenge

Workshop Leaders:

Bryan T. Bet, MS, Army Public Health Center, Aberdeen Proving Ground, MD

Andrea K. Clark, BS, 2LT, Army Public Health Center, Aberdeen Proving Ground, MD

Communicating with highly concerned and potentially affected stakeholders about a known or even suspected occupational or environmental hazard can be daunting and some issues present many unique communication challenges. The Army Public Health Center has provided both technical and risk communication consultation support to several organizations impacted by occupational or environmental hazards over the last 15 years. The purpose of this workshop is to provide the toxicologist and risk assessor with a risk communication perspective on best practices, highlighting challenges and solution strategies used in recent cases to bring stakeholders to a point at which their level of concern is proportionate to the severity of the potential health risks. Risk communication challenges specific to occupational and environmental hazard result from current scientific understanding, the inability to definitely convey potential exposure duration, the presence of potential contaminants of concern in many commercially available household and industrial products, the limitations of technology currently available for the purposes of detection and/or monitoring, the potential for disproportionate negative health effects, and mixed messages from various regulatory agencies about how to be protective of sensitive subpopulations. This workshop will offer the technical experts a better understanding of the positive impact their work has on alleviating undue concern and, more importantly, how they can better

Monday - Tuesday, April 23-4, 2018

communicate with concerned stakeholders regarding occupational or environmental hazards until some or all of these challenges are overcome.

8:30 am - 5:00 pm

A2 and B2: Basic Concepts in Risk Assessment and Dose-Response Modeling*

Workshop Leaders:

Lynne T. Haber, Ph.D., DABT, Risk Science Center, University of Cincinnati, Cincinnati, OH

M. Andrew Maier, Ph.D., DABT, Risk Science Center, University of Cincinnati, Cincinnati, OH

Part I - Developments in Risk Assessment: Basic Concepts for Evaluating Toxicity Data for Human Health Risk Assessment

The first part of this workshop will provide an overview and update on current methods for human health risk assessment. We will address basic risk assessment methods, including hazard characterization and dose-response for chemicals with and without a threshold. We will emphasize the critical thinking used in risk assessment, and how recent developments affect the approaches used. Methods for critically evaluating and integrating data will be discussed. The course will be interactive and provide opportunities for participants to ask questions.

Part II - Benchmark Dose Modeling Basic Concepts, Issues and Practice in Modeling

The second part of this workshop will present the concepts used in benchmark dose modeling, comparing and contrasting the guidance from the US EPA and EFSA (the European Food Safety Authority). The overview is followed by in-depth discussion of the methods used for modeling dichotomous and continuous endpoints. This workshop provides the background needed for Thursday's workshop on advanced BMD modeling issues.

***Participants are asked to bring their laptop for the afternoon session with the US EPA Benchmark Dose Software (BMDS; available at <https://www.epa.gov/bmds>) loaded and ready for use.**

Tuesday, April 24, 2018 8:30 am – 11:45 am

8:00 am – 2:00 pm

Registration

MORNING SESSION

8:30 am – 8:45 am

Welcome and Conference Opening Remarks

Conference Co-chairs:

David R. Mattie, PhD, DABT, 711 HPW/RHDJ, Wright Patterson Air Force Base, OH

Elizabeth Irvin-Barnwell, PhD, the Centers for Disease Control and Prevention, the Agency for Toxic Substances and Disease Registry, Atlanta, GA

Tuesday, April 24, 2018

8:45 am – 11:45 am Plenary Session

Models, Methods, and Emerging Concerns in Toxicology and Risk Assessment

11:45 am – 1:00 pm Lunch

8:45 am – 11:45 am Plenary Session
Session times include 30 min break

PL. Models, Methods, and Emerging Concerns in Toxicology and Risk Assessment

The plenary session will focus on the theme of TRAC 2018, “Models, Methods, and Emerging Concerns.” Emerging concerns include the evaluation of long-term health effects for various chemicals and exposure mechanisms. Another important area is the impact of different modeling and methodologic considerations on policy development. The keynote presentations in this plenary session will review scientific and policy issues of importance to this theme for environmental, occupational, and military toxicology and risk assessment activities.

Keynote Presentations:

8:45 am – 9:15 am	Tina Bahadori, ScD, MS, Director, National Center for Environmental Assessment, US Environmental Protection Agency, Washington, DC
9:15 am – 9:45 am	Linda S. Birnbaum, PhD, DABT, ATS, Director, National Institute of Environmental Health Sciences and the National Toxicology Program, Research Triangle Park, NC
9:45 am – 10:15 am	Patrick N. Breyse, PhD, MS, CIH, Director, National Center for Environmental Health and Agency for Toxic Substances and Disease Registry, Atlanta, GA
10:15 am – 10:45 am	BREAK
10:45 am – 11:15 am	John J. Resta, MS, ME, BS, PE, Director, US Army Public Health Center, US Army Medical Command, Aberdeen Proving Ground, MD
11:15 am – 11:45 am	Question & Answer/Panel Discussion
11:45 am – 1:00 pm	Lunch

Tuesday, April 24, 2018

Tuesday, April 24, 2018

1:00 pm – 5:00 pm

AFTERNOON SESSION

1:00 pm – 5:00 pm

C1 - Methods for Assessing Long-term Effects after Acute Exposures: Case Studies with Respiratory Irritants

C2 - Toxicity Testing of Energetic Materials as an Example of Pre-acquisition Screening and Risk Assessment in the DoD

C3 - Current Practices in Federal Agencies Using Computational Tools in Safety Science

Sessions

Session times include 30 min break

C1. Methods for Assessing Long-term Effects after Acute Exposures: Case Studies with Respiratory Irritants

Co-chairs:

Laurie E. Roszell, PhD, US Army Public Health Center, Aberdeen Proving Ground, MD

George Woodall, PhD, US Environmental Protection Agency, Research Triangle Park, NC

Chemical poisoning after acute high doses is often fatal, however if symptoms can be controlled through medical intervention, many people can survive the acute toxicity. A major question being investigated by epidemiologists and basic scientists is whether there are adverse health effects subsequent to surviving sublethal acute exposures. These effects could occur within days, weeks, or even many years after the exposure. This is a significant public health concern as more evidence emerges of long-term health effects following acute exposure to toxic industrial chemicals (TICs) such as chlorine and ammonia. The acute effects (lethal and non-lethal) of many TICs have been well described, and data exist for the assessment of hazard and risk. However, understanding and assessing the risk of long-term sequelae is less clear, and depends almost entirely on the data available from previous exposures. Often the assessment is largely retrospective, relying on qualitative data by estimating signs and symptoms at the time of exposure and how long it took for them to develop. This symposium will present several examples of methods for assessing long-term effects in humans and animals following acute exposures, focusing on chlorine. Chlorine exposures may be the result of accidental or intentional releases.

The contents and the views expressed in this abstract are of the authors and do not reflect the policies of US Environmental Protection Agency or the US Army.

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|--------------------------|---|
| 1:00 pm – 1:15 pm | Session overview
Laurie Roszell, PhD, US Army Public Health Center, Aberdeen Proving Ground, MD |
| 1:15 pm – 1:45 pm | Lessons learned from the response and long-term follow-up of individuals exposed to chlorine following a train derailment in 2007, and how they can be applied to future incidents
Erik Svendsen, Ph.D., DABT, Medical University of South Carolina, Charleston, SC |
| 1:45 pm – 2:15 pm | Mechanistic studies of chlorine toxicity, and how they can inform the understanding of long-term adverse health effects
Annie Jarabek, PhD, US Environmental Protection Agency, Cincinnati, OH |
| 2:15 pm – 2:45 pm | Long-term follow up of US service members exposed to respiratory irritants in overseas engagements
Joe Abraham, PhD, US Army Public Health Center, Aberdeen Proving Ground, MD |
| 2:45 pm – 3:15 pm | BREAK |
| 3:15 pm – 3:45 pm | Development of Provisional Advisory Levels for chlorine
John C. Lipscomb, PhD, DABT, ATS, US Environmental Protection Agency, Cincinnati, OH |
| 3:45 pm – 4:15 pm | Utilization of a toxidrome based approach and the Delphi method for the elicitation of expert opinions to estimate likelihood of long-term effects from lower pulmonary irritants
Kevin Wegman, PhD, Battelle Memorial Institute, Columbus, OH |
| 4:15 pm – 5:00 pm | Panel discussion: How do we incorporate these issues into human health risk assessment and risk assessment guidelines?
Session co-chairs and presenters |

C2. Toxicity Testing of Energetic Materials as an Example of Pre-acquisition Screening and Risk Assessment in the DoD

Co-chairs:

Mark S. Johnson, PhD, US Army Public Health Center, Aberdeen Proving Ground, MD
David R. Mattie, PhD, US Air Force Research Laboratory, Bioeffects Division, Wright Patterson Air Force Base, Dayton, OH
Karen L. Mumy, PhD, US Navy, Navy and Marine Research Unit-Dayton, Wright Patterson Air Force Base, Dayton, OH

Traditionally, development of munition systems and platforms were focused on performance criteria to evaluate maturation and further investment. Recent events where environmental releases of energetic substances have resulted in ground water contamination and off-site transport has resulted in cessation of training operations has suggested the potential for a decrease in military readiness. Additionally,

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specific public health data are needed to protect the warfighter, worker, and the general population if exposures are expected. Here we provide methods and examples of collecting toxicology information that is commensurate with the level of investment of a system. Using a phased approach, we provide a methodology whereby specific toxicology, chemical-physical data are collected and decisions made that benefit system implementation and health of the forces.

The contents and the views expressed in this abstract are of the authors and do not reflect the policies of the US Air Force, US Army, or the US Navy.

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|--------------------------|---|
| 1:00 pm – 1:10 pm | Introduction by co-chairs |
| 1:10 pm – 1:40 pm | Army Public Health Center's Phased Approach for Toxicity Evaluations of New Compounds
Michael J. Quinn Jr., PhD, US Army Public Health, Center, Aberdeen Proving Ground, MD |
| 1:40 pm – 2:10 pm | In vitro toxicity screening of high nitrogen content (HNC) energetic Compounds
Valerie H. Adams, PhD, DABT, Army Public Health, Center, Aberdeen Proving Ground, MD |
| 2:10 pm – 2:40 pm | Aerospace toxicology in the Air Force Research Laboratory
David R. Mattie, PhD, DABT, US Air Force Research Laboratory, Bioeffects Division, Wright-Patterson Air Force Base, Dayton, OH |
| 2:40 pm – 3:10 pm | BREAK |
| 3:10 pm – 3:40 pm | Development and Application of enhanced <i>in vitro</i> models for aerospace toxicology and energetic material screening
Laura Braydich-Stolle, PhD, US Air Force Research Laboratory, Bioeffects Division, Wright-Patterson Air Force Base, Dayton, OH |
| 3:40 pm – 4:10 pm | Toxicology Research in the Environmental Health Effects Lab at the Naval Medical Research Unit Dayton
Karen L. Mummy, PhD, DABT, US Navy, Naval Medical Research Unit-Dayton, Wright-Patterson Air Force Base, Dayton, OH |
| 4:10 pm – 4:40 pm | Assessment of the palatability of powdered 2,4-dinitroanisole (DNAN) mixed with feed in rats (<i>Rattus norvegicus</i>).
Jed Lynn, PhD, US Navy, Naval Medical Research Unit-Dayton, Wright-Patterson Air Force Base, Dayton, OH |
| 4:40 pm – 5:00 pm | Question & Answer/Panel Discussion |

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C3. Current Practices in Federal Agencies Using Computational Tools in Safety Science

Co-chairs:

Rachel Worley, PhD, Centers for Disease Control and Prevention/Agency for Toxic Substances and Disease Registry, Atlanta, GA

Jeff Fisher, PhD, Federal Drug Administration, Jefferson, AR

The National Research Council and the United States Environmental Protection Agency's vision for the future of toxicity testing and risk assessment, called 'Toxicity Testing in the 21st Century,' is broadly accepted and strives to establish methods that are more efficient and effective, and less expensive for assessing the human health hazards posed by environmental chemicals. Computational methods including physiologically-based pharmacokinetic (PBPK) and qualitative structure-activity relationship (QSAR) modeling are important components of this vision and can be used to predict properties and characteristics of chemicals in the environment, and to determine what biological perturbations may occur when people are exposed.

These methods emerged in the 1980s and are now used widely in toxicology and risk assessment. The application of these tools in the federal sphere is increasing as many federal agencies recognize their utility to answer important questions with limited resources. However, federal agencies face unique challenges when incorporating computational methods into decision making. This session provides an opportunity for federal agency representatives to describe how computational tools are used in their work, the ways that these methods can complement and improve upon traditional health and safety assessment, future directions, and limitations and challenges of incorporation of in silico methods.

The contents and the views expressed in this abstract are of the authors and do not reflect the policies of the Agency for Toxic Substances and Disease Registry or the US Federal Drug Administration.

1:00 pm – 1:10 pm Introduction by co-chairs

1:10 pm – 1:40 pm Non-regulatory application of computational tools in a community health investigation: Evaluation of inhalation exposures to benzene in Corpus Christi, Texas

Rachel R. Worley, PhD, Centers for Disease Control and Prevention/ Agency for Toxic Substances and Disease Registry, Atlanta, GA

1:40 pm – 2:10 pm Biologically based dose-response (BBDR) modeling to predict effects of perchlorate exposure on thyroid hormone levels in women prior to and during early gestation

Paul M. Schlosser, PhD, US Environmental Protection Agency, Washington, DC

2:10 pm – 2:40 pm Computational methods for integrating internal exposure in quantitative safety assessments for the very young

Jeffrey Fisher, PhD, US Food and Drug Administration, Jefferson, AR

2:40 pm – 3:10 pm BREAK

3:10 pm – 3:40 pm Application of computational methods for safety assessment of food additives

Shruthi Kabadi, PhD, US Food and Drug Administration, Jefferson, AR

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3:40 pm – 4:10 pm **Development of a physiologically-based pharmacokinetic (PBPK) model for the virtual high-performance aircraft pilot**
Jeffrey M. Gearhart, PhD, The Henry M. Jackson Foundation for Military Medicine, Wright-Patterson Air Force Base, Dayton, OH

4:10 pm – 5:00 pm **Question & Answer/Panel Discussion**

Tuesday, April 24, 2018

5:45 pm – 7:45 pm

EVENING SESSION

5:45 pm – 7:45 pm **Poster Session**

Poster Session

Co-chairs:

J. Phillip Kaiser, PhD, DABT, US Environmental Protection Agency, Cincinnati, OH

Dan Xu, LT, MSC, US Navy, Wright Patterson Air Force Base, Dayton, OH

Judges for the TRAC Poster Session Trainee Competition Merit Awards:

Jeffrey Dean, US Environmental Protection Agency, Cincinnati, OH

Matthew Shipman, LCDR, US Navy, Wright Patterson Air Force Base, Dayton, OH

Randall J. Smith, MS, National Institute for Occupational Safety and Health, Cincinnati, OH

Wednesday, April 25, 2018

8:30 am – 11:45 am

8:00 am – 2:00 pm **Registration**

MORNING SESSION

8:30 am – 11:45 am **D1 – Understanding Risks from Exposures to Perfluorinated Alkyl Substances (PFAS): Current Science and Research Needs**

D2 – Chemical Exposures and Neurological Health Effects

11:45 am – 12:50 pm **Lunch**

Sessions

Session times include 30 min break

D1. Understanding Risks from Exposures to Perfluorinated Alkyl Substances (PFAS): Current Science and Research Needs

Co-chairs:

Michael J. Quinn, PhD, US Army Public Health Center, Aberdeen Proving Ground, MD

Terra D. Irons, Post-Deployment Health Services, Department of Veterans Affairs, Washington, DC

Wednesday, April 25, 2018

Suzanne E. Fenton, Reproductive Endocrinology Group, Laboratory Division, National Toxicology Program, National Institute of Environmental Health Sciences, Durham, NC

Per- and poly-fluorinated alkyl substances (PFAS) have historically been used in multiple industrial applications, such as fire-fighting foams, anti-stain products for carpet and upholstery and heat-resistant, nonstick cookware. These substances are persistent in the environment and have been shown to bioaccumulate. Low levels of these substances have been found in tissues of humans, and their kinetics *in* and *ex vivo* are poorly understood. Effects in laboratory animals from exposure have been associated with low birth weights, elevated cholesterol levels and immunotoxicity. Analytical concentrations of these substances in some municipal drinking water supplies have halted use of those sources. This session will focus on the relevant available and emerging science on these complex substances and review the scientific support for public health criteria. It will also focus on on-going efforts and attempt to prioritize emerging research needs to protect public health.

The views expressed in this abstract are those of the authors and do not necessarily represent the views or policies of the US Army, Department of Veterans Affairs, or the National Institute of Environmental Health Sciences/National Toxicology Program.

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|----------------------------|---|
| 8:30 am – 9:00 am | Hazard Assessment of Perfluorooctane Sulfate (PFOS) and Perfluorooctanoic Acid (PFOA) for Potential Impacts to the National Defense and Identification of Risk Management Options
Andrew Rak, MS, Noblis, Inc., Chantilly, VA |
| 9:00 am – 9:30 am | Investigations of Per- and Polyfluorinated Compounds in Environmental Samples and Contemporary Products
Mark Strynar, PhD, US Environmental Protection Agency, Research Triangle Park, NC |
| 9:30 am – 10:00 am | Remediation Challenges and Opportunities for AFFF-impacted Sites
Christopher P. Higgins, PhD, Colorado School of Mines, Golden, CO |
| 10:00 am – 10:30 am | BREAK |
| 10:30 am – 11:00 am | Lab-scale Evaluation of in-situ-Amenable Abiotic Remediation Technologies and Analytical Challenges with Per/polyfluoroalkyl Acids
Linda Lee, PhD, Purdue University, West Lafayette, IN |
| 11:00 am – 11:30 am | Examination of Sub-lethal effects of Four Per/polyfluoroalkyl Acids (PFAAs) on Three Species of US-Native Amphibians
Maria S. Sepulveda, PhD, Purdue University, West Lafayette, IN |
| 11:30 am – 11:45 am | Question & Answer/Panel Discussion |

D2. Chemical Exposures and Neurological Health Effects

Co-chairs:

Laurie Roszell, PhD, US Army Public Health Center, Aberdeen Proving Ground, MD

Sudha P. Pandalai, MD, PhD, National Institute for Occupational Safety and Health, Cincinnati, OH

Wednesday, April 25, 2018

Neurotoxic outcomes from occupational (civilian and military) and environmental chemical exposures are important adverse health effects, which can occur from short or long durations of exposures. Such effects can be acute or chronic, and can occur from various routes of exposure (inhalation, dermal, and oral). This session will present various toxicologic effects in the nervous system. Presentations will begin with an overview of how chemical exposures can result in neurotoxic effects. Following this introduction, there will be discussions of toxicology and risk assessment topics, with special focus on occupational and environmental manganese exposure. The session will conclude with a discussion of emerging neurotoxins from the perspective of the Department of Defense.

The views expressed in this abstract do not reflect any policy or determination by the National Institute for Occupational Safety and Health or the US Army and solely reflect the views of the authors.

8:30 am – 9:00 am	Olfactory and central neurotoxicity of occupationally-relevant chemical and particulate agents Krishnan Sriram, PhD, National Institute for Occupational Safety and Health, Morgantown, WV
9:00 am – 9:30 am	Electrophysiological technique in neurotoxicity assessment following in vivo exposures to jet fuels Joyce G. Rohan, PhD, Naval Medical Research Unit Dayton, U.S. Navy, Wright Patterson Air Force Base, OH
9:30 am – 10:00 am	Neuroradiology Assessment of Toxicologic Chemical Exposure Effects in the Brain Ulrike Dydak, PhD, Purdue University, Lafayette, IN
10:00 am – 10:30 am	BREAK
10:30 am – 11:00 am	Manganese Exposure and Neurocognition in a Pediatric Cohort Erin N. Haynes, DrPH, MS, University of Cincinnati, Cincinnati, OH
11:00 am – 11:30 am	Neurotoxins as Emerging Contaminants Nirzwan Bandolin, MS, Office of the Secretary of Defense, Aberdeen Proving Ground, MD
11:30 am – 11:45 am	Question & Answer/Panel Discussion
11:45 am – 12:50 pm	Lunch

Wednesday, April 25, 2018

1:00 pm – 5:00 pm

AFTERNOON SESSION

12:50 pm -1:00 pm	General Remarks and Poster Session Trainee Competition Merit Awards Conference and poster session organizers
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Wednesday, April 25, 2018

1:00 pm – 5:00 pm

E1 – Ongoing Risk Assessment Efforts for Per- and Polyfluoroalkyl Substances

E2 – Microbiome Toxicology: Understanding the Role of the Microbiome in Modulating Toxin Exposure Outcome

Sessions

Session times include 30 min break

E1. Ongoing Risk Assessment Efforts for Per- and Polyfluoroalkyl Substances

Co-chairs:

Rachel Worley, PhD, Agency for Toxic Substances and Disease Registry, Atlanta, GA

Linda Gaines, PhD, PE, US Environmental Protection Agency, Washington, DC

Per- and polyfluoroalkyl substances (PFAS) contamination is present in many municipal and private drinking water supplies throughout the United States. Concerted efforts are underway at the federal and state level to establish methods for assessing the risks associated with exposure to PFAS. In May 2016, the US Environmental Protection Agency (EPA) issued drinking water lifetime health advisory (HA) values for perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS). The Agency for Toxic Substances and Disease Registry (ATSDR) is updating the toxicological profile for perfluoroalkyls, including the development of minimum risk levels (MRLs) for PFOA, PFOS, PFHxS, and PFNA. Many states have developed their own health-based guidance values for PFAS, taking the specific concerns of their state communities into consideration. While much focus has been given to legacy PFAS including PFOA and PFOS, several states are beginning to grapple with detections of new generation PFAS in surface water and drinking water supplies. Interest about the health effects of exposure to these chemicals is growing, while risk assessment remains challenging. This session provides an opportunity for representatives from federal and state agencies to describe their efforts to assess the risk associated with exposure to a wide range of PFAS, to discuss the challenges of developing guidance values for emerging contaminants, and to speculate about the future of PFAS risk assessment.

The views expressed in this abstract do not reflect any Agency for Toxic Substances and Disease Registry or US Environmental Protection Agency policy or determination and solely reflect the views of the authors.

1:00 pm – 1:10 pm

Introduction by co-chairs

1:10 pm – 1:45 pm

Derivation of ATSDR's Provisional Minimal Risk Levels for PFOA, PFOS, PFHxS, and PFNA

Melanie Buser, PhD, Centers for Disease Control and Prevention/ Agency for Toxic Substances and Disease Registry, Atlanta, GA

1:45 pm – 2:20 pm

Recent updates to Minnesota drinking water guidelines for PFOS and PFOA – Incorporation of and Excel-based model to address indirect exposure pathways

Helen Goeden, PhD, Minnesota Department of Health, St. Paul, MN

Wednesday, April 25, 2018

- 2:20 pm – 2:55 pm** **Development of a health goal for an emerging PFAS in drinking water, North Carolina, 2017**
Beth Dittman, MS, North Carolina Department of Health and Human Services, Raleigh, NC
- 2:55 pm – 3:25 pm** **BREAK**
- 3:25 pm – 4:00 pm** **PFAS risk assessment at Superfund sites**
Linda Gaines, PhD, US Environmental Protection Agency, Washington, DC
- 4:00 pm – 4:35 pm** **PFAS human health risk assessment: Current trends and challenges**
Lynn Flowers, PhD, DABT and Kathleen Raffaele, PhD, US Environmental Protection Agency, Washington, DC
- 4:35 pm – 5:00 pm** **Question & Answer/ Panel Discussion**

E2. Microbiome Toxicology: Understanding the Role of the Microbiome in Modulating Toxin Exposure Outcome

Co-chairs:

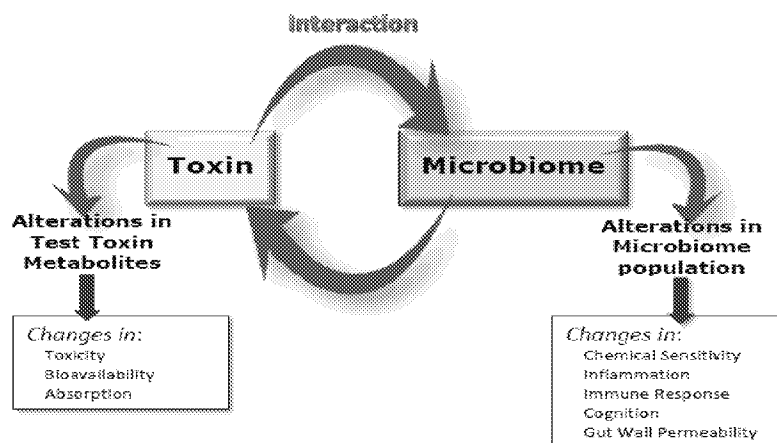
Camilla A. Mauzy, PhD, US Air Force Research Laboratory, Wright Patterson Air Force Base, Dayton, OH

Laurie E. Roszell, PhD, US Army Medical Command, Army Public Health Center, Aberdeen Proving Ground, MD

Elaine A. Merrill, PhD, US Air Force Research Laboratory, Wright Patterson Air Force Base, Dayton, OH

While the interactions of the gut microbiome with xenobiotics and drug metabolism have been well studied, only recently has this area of research been expanded to examine how individual microbiome populations can modulate toxicity. The new area of '*Microbiome Toxicology*' includes both the examination of how toxins alter microbiome populations leading to changes in host cells as well as how individual bacteria can alter chemicals to change its toxicological properties. We will provide an overview on the status of microbiome research (gut, lung) and present examples of interactions between the microbiome and chemicals/airborne hazards using both *in vitro* and *in vivo* models. Discussions will also center on how data generated from these models will be incorporated into individual risk assessments and practices. Lastly, we will present information on mapping out strategies for integration of good practices into future microbiome studies.

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1:00 pm – 1:10 pm Introduction by Co-chairs

1:10 pm – 1:45 pm Effects of Airborne Hazard Inhalation on the Lung Microbiome
Camilla A. Mauzy, PhD, Wright Patterson Air Force Base, Dayton, OH

1:45 pm – 2:20 pm Cadmium ingestion promotes a gut microenvironment that promotes airway allergic responses
Estelle Cormet-Boyaka, PhD, Department of Veterinary Biosciences, The Ohio State University, Columbus, OH

2:20 pm – 2:55 pm Heavy Metal Effects on Diverse Microbiota
John Lewis, PhD, US Army Center for Environmental Health Research, Ft. Detrick, MD

2:55 pm – 3:25 pm BREAK

3:25 pm – 4:00 pm Recognizing Confounding Factors for Human Microbiome Toxicology Studies
Andrew Hoisington, PhD, Lt Col, Wright-Patterson Air Force Base, OH

4:00 pm – 4:35 pm Assessing Risks from Environmental Chemical and Human Microbiome interactions
Pamela Shubat, PhD, NAS Committee Member, "Environmental Chemicals, the Human Microbiome, and Health Risk" Strategy Development

4:35 pm – 5:00 pm Roundtable Discussion/Question & Answer

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8:00 am – 5:00 pm

8:00 am – 2:00 pm

Registration

Workshops

***(Separate registration required)**

Workshop times include 30 min break in am and in pm periods

8:30 am – 11:45 am

- | | |
|-----------|--|
| F1 | Human Health Risk Assessment: A Case Study Application of Principles in Dose-Response Assessment (full day with W-3b) |
| F2 | Chemical Mixtures Health Risk Assessment of Environmental Contaminants: Concepts, Methods, and Applications (full day with W-4b) |

11:45 am – 1:00 pm

Lunch

1:00 pm – 5:00 pm

- | | |
|-----------|--|
| G1 | Human Health Risk Assessment: A Case Study Application of Principles in Dose-Response Assessment (full day with W-3a) |
| G2 | Chemical Mixtures Health Risk Assessment of Environmental Contaminants: Concepts, Methods, and Applications (full day with W-4a) |

Workshops

8:30 am -5:00 pm

F1 and G1. Human Health Risk Assessment: A Case Study Application of Principles in Dose-Response Assessment*

Workshop Leaders:

Lucina Lizarraga, PhD, US Environmental Protection Agency, Cincinnati, OH

Jay Zhao, MD, PhD, US Environmental Protection Agency, Cincinnati, OH

This case study application workshop will build on fundamental concepts and techniques in risk assessment presented and archived at previous TRAC meeting workshops. Practical examples from publicly available, peer reviewed risk assessments will be used as teaching aids. Course modules will be organized according to the key components of the risk assessment process: hazard characterization, dose response modeling (including Benchmark Dose methodology), dosimetric adjustment, point of departure selection, and uncertainty analysis and risk value derivation such as reference dose and cancer slope factor. The participants will have a unique opportunity to learn and apply conventional

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methodologies, detailed considerations and emerging approaches in support of human health risk assessment.

***Participants are expected to have a general understanding of basic benchmark dose methods, either through work-related experience, or previous completion of at least the introductory portion of online training courses (<http://epa.gov/ncea/bmds/training/index.html>).**

*** Participants need to bring their own laptops to the workshop with a Benchmark Dose Software (BMDS) installed. The latest version of the software programs can be found at: <http://epa.gov/ncea/bmds/>. Specific installation instructions for the software programs can be found on the BMDS websites.**

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F2 and G2. Chemical Mixtures Health Risk Assessment of Environmental Contaminants: Concepts, Methods, and Applications*

Workshop Leaders:

Organizer: Glenn Rice, ScD, US Environmental Protection Agency, Cincinnati, OH

Co-Leaders:

Richard C. Hertzberg, Atlanta, GA

Moiz Mumtaz, MSc, MS, PhD, FATS, Centers for Disease Control and Prevention/US Agency for Toxic Disease Registry, Atlanta, GA

Jeff Swartout, PhD, US Environmental Protection Agency, Cincinnati, OH

Linda Teuschler, MS, LT Associates, LLC, St. Petersburg, FL

Workshop Abstract and Overview Agenda:

This problems-based, introductory workshop focuses on methods to assess health risks posed by exposures to chemical mixtures in the environment. Chemical mixtures health risk assessment methods continue to be developed and evolve to address concerns over health risks from multichemical exposures. This workshop presents key concepts and terminology used in chemical mixtures risk assessment. The course discusses component methods that utilize assumptions of response addition and dose addition, including the following dose-additive methods: the hazard index, interaction-based hazard index, relative potency factors, and toxicity equivalence factors; integrated additivity methods also will be described. There will also be a short discussion of whole mixtures risk assessment, including the development of reference doses and slope factors from whole mixtures toxicity data, and the potential uses of 21st century toxicity data in mixtures risk assessment. The risk assessment examples developed in the workshop are adapted from real-world mixture analyses, e.g., waste site contaminants, pesticide applications, and drinking water disinfection by-product exposures. The “hands-on” exercises demonstrating the methods are an essential part of this workshop. Discussions include real world examples, exercise results, and answers to general questions.

***Participants are asked to bring a calculator or laptop.**

8:30–9:10 Welcome and Introductions, Basic Concepts, Mixture Exposure Assessment

Glenn Rice, ScD, US Environmental Protection Agency, Cincinnati, OH

Topics: Key concepts in chemical mixture risk assessment

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Terminology
Overview of Chemical Mixtures Exposure Assessment

- 9:10–9:55 Response Addition, Dose Addition, and Integrated Addition Methods**
Linda Teuschler, MS, LT Associates, LLC, St. Petersburg, FL
Topics: Response Addition
Dose Addition
Hazard Index
Relative Potency Factor (RPF) Methodology
Toxicity Equivalence Factor (TEF) Methodology
Integrated Addition Methods
- 9:55–10:50 Exercise and Exercise Discussion (includes Break)**
Linda Teuschler, MS, LT Associates, LLC, St. Petersburg, FL
Topics: Estimating Chemical Mixture Health Risks using Response Addition
Estimating the Hazard Index
Estimating RPFs and Mixture Health Risks using Integrated Addition
- 10:50–11:35 Toxicological Interactions**
Moiz M. Mumtaz, PhD, Agency for Toxic Substances and Disease Registry, Atlanta, GA
Topics: The Hazard Index Approach: Use of Chemical Interactions Data
Mixtures Found at U.S. Superfund Sites
Conceptual Basis of Interactions
Interactions: Binary Weight of Evidence
Interaction Profiles
- 11:35–12:15 A Community Example: Chemical Mixtures Health Risk Assessment**
Richard A. Hertzberg, PhD, Emory University, Atlanta, GA
Topics: Palmerton, PA: Background
Interaction-based Hazard Index
Quantification of Interaction
- 12:15–1:30 Lunch**
- 1:30–2:15 Advances in Chemical Mixtures Risk Methods: Dose Addition**
Jeffrey Swartout, PhD, US Environmental Protection Agency, Cincinnati, OH
Topics: Methods to predict mixture response if component dose response shapes differ
Issues modeling continuous data
- 2:15–2:45 Break**
- 2:45–3:30 Whole Mixtures Risk Assessment**
Glenn Rice, ScD, US Environmental Protection Agency, Cincinnati, OH
Topics: Developing Slope Factors and Reference Doses for Whole Mixtures
Sufficient Similarity
- 3:30–4:30 Chemical mixture methods applied to real world mixtures and regulations:
A tobacco smoke example**
Linda Teuschler, MS, LT Associates, LLC, St. Petersburg, FL
- 4:30–5:00 Question & Answer/Discussion**
Moiz M. Mumtaz, PhD, Agency for Toxic Substances and Disease Registry, Atlanta, GA

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